



LM-79-08 Test Report

for

ESPEN TECHNOLOGY, INC.

12257 Florence Ave, Santa Fe Springs CA 90670, USA

LED TUBE

Model: L48T8/830/10G-ID DE

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19030041a

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

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Mar. 28, 2019

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Mar. 28, 2019

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Test Summary

Model	L48T8/830/10G-ID DE
Luminous Efficacy (Lumens /Watt)	149.2
Total Luminous Flux (Lumens)	1637.0
Power (Watts)	10.97
Power Factor	0.9831
CCT (K)	2997
CRI	81.5
Stabilization Time (Light & Power)	60 mins
Note	3000K

Table 1: Executive Data Summary

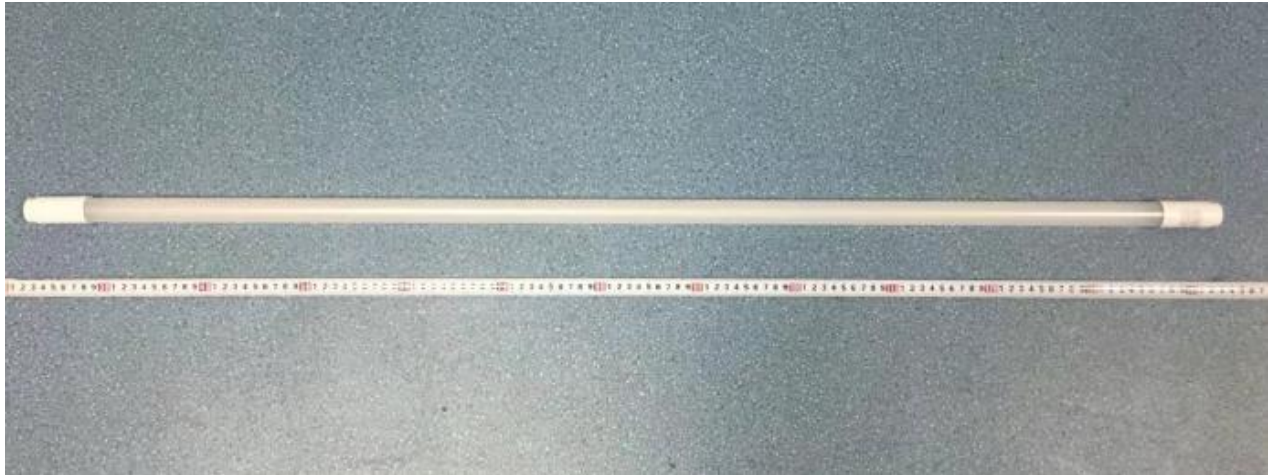
Test specifications:

Date of Receipt	: Oct. 09, 2017
Date of Test	: Oct. 10, 2017
Test item	: Total Luminous Flux, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
Reference Standard	: IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

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Sample Photo



Sample view

Equipment Under Test (EUT)

Name	: LED TUBE
Model	: L48T8/830/10G-ID DE
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: G13 base, 3000K

TEST RESULTS

Test ambient temperature was 24.9°C.

Test orientation was horizontal. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 65 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.093	0.043
Power Factor	0.9831	0.9327
Test Power (W)	10.97	11.20
THD A%	17.70	20.27
Luminous Efficacy (lm/W)	149.2	147.6
Total Luminous Flux (lm)	1637.0	1653.0
Color Rendering Index (CRI)	81.5	
R9	3.3	
Correlated Color Temperature (CCT)(K)	2997	
Chromaticity Chroma x	0.4372	
Chromaticity Chroma y	0.4043	
Chromaticity Chroma u	0.2507	
Chromaticity Chroma v	0.3481	
Duv	0.0008	
Chromaticity Chroma u'	0.2507	
Chromaticity Chroma v'	0.5215	

Special Color Rendering Indices	
R1	80
R2	91.2
R3	94.6
R4	79.3
R5	79.4
R6	88.6
R7	81.8
R8	56.7
R9	3.3
R10	80.4
R11	78.3
R12	69.6
R13	83
R14	97.5

Table 2: Test data per Sphere-Spectroradiometer Method

Note: According to CIE 1976 (u',v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

Spectral Power Distribution - Sphere Spectroradiometer Method

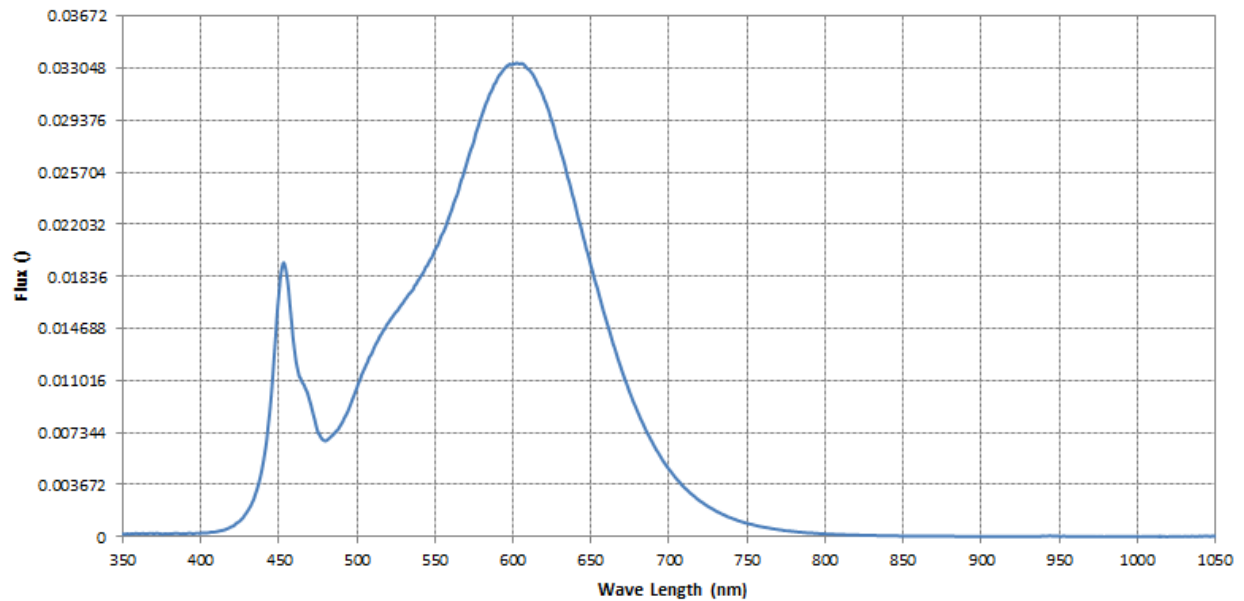
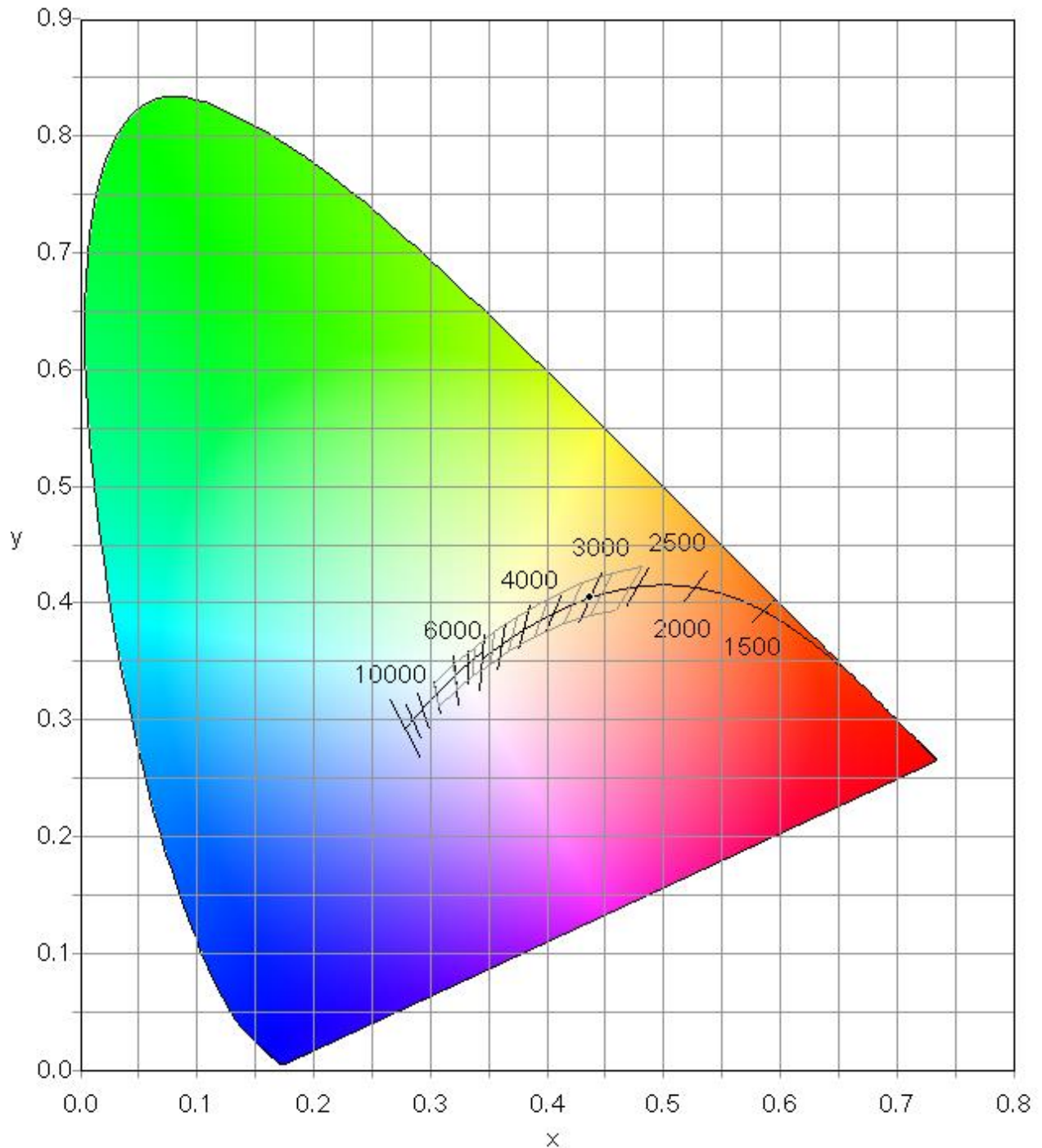


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.11E-04	485	7.21E-03	590	3.23E-02	695	5.57E-03
385	2.39E-04	490	7.95E-03	595	3.31E-02	700	4.76E-03
390	2.06E-04	495	9.05E-03	600	3.33E-02	705	4.06E-03
395	2.15E-04	500	1.05E-02	605	3.34E-02	710	3.45E-03
400	2.53E-04	505	1.19E-02	610	3.30E-02	715	2.95E-03
405	2.88E-04	510	1.30E-02	615	3.21E-02	720	2.51E-03
410	3.57E-04	515	1.42E-02	620	3.08E-02	725	2.14E-03
415	4.82E-04	520	1.51E-02	625	2.93E-02	730	1.83E-03
420	7.32E-04	525	1.58E-02	630	2.74E-02	735	1.55E-03
425	1.10E-03	530	1.66E-02	635	2.54E-02	740	1.32E-03
430	1.80E-03	535	1.73E-02	640	2.34E-02	745	1.12E-03
435	3.00E-03	540	1.82E-02	645	2.12E-02	750	9.58E-04
440	5.22E-03	545	1.91E-02	650	1.91E-02	755	8.14E-04
445	9.77E-03	550	2.02E-02	655	1.71E-02	760	6.95E-04
450	1.71E-02	555	2.14E-02	660	1.52E-02	765	6.00E-04
455	1.85E-02	560	2.28E-02	665	1.34E-02	770	5.08E-04
460	1.32E-02	565	2.44E-02	670	1.16E-02	775	4.27E-04
465	1.09E-02	570	2.62E-02	675	1.01E-02	780	3.75E-04
470	9.49E-03	575	2.79E-02	680	8.79E-03		
475	7.39E-03	580	2.97E-02	685	7.56E-03		
480	6.77E-03	585	3.12E-02	690	6.51E-03		

Table 3: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y) : (0.4372, 0.4043)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

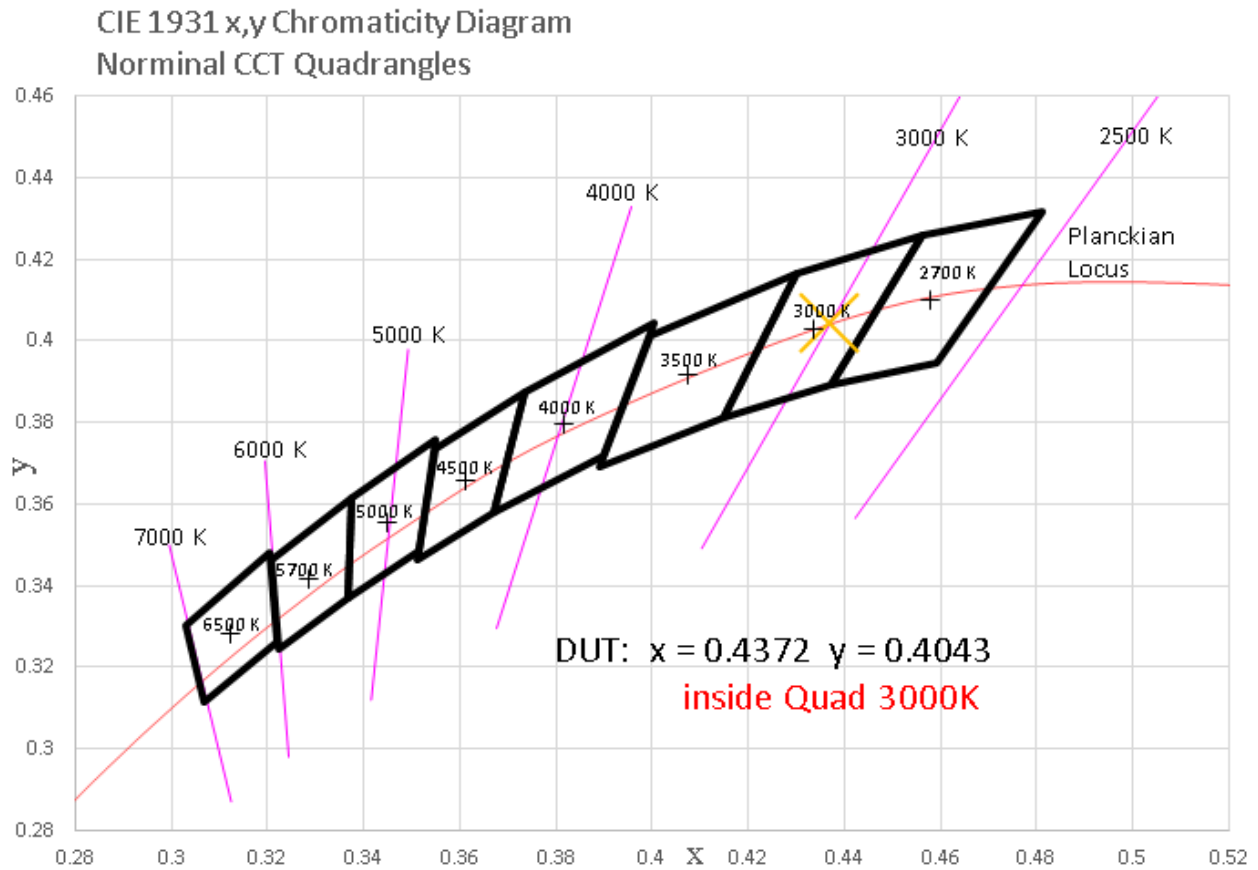


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Integrate Sphere system	2M	HZTE015-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	WT210	HZTE008-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	PCR 500L	HZTE001-07	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	IT6154	HZTE004-04	Aug. 10, 2017	Aug. 09, 2018
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 16, 2017	Aug. 15, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 20, 2017	Aug. 19, 2018
Temperature Meter	TES1310	HZTE017-01	Aug. 17, 2017	Aug. 16, 2018

Table 4: Test Equipment List

TEST METHODS

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning. Therefore, no seasoning was performed.

Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

A Labsphere Model CDS 2100 Spectroradiometer and Two Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is 4π . Self-absorption correction is conducted in testing. Bandwidth of spectroradiometer is 350nm-1050nm.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED TUBEs) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.

The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.

The uncertainty of integrating sphere system reported in this document is expanded uncertainty is 2.1% with a coverage factor $k=2$.

*** End of Report ***

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